

NOTES ON SOME "QUILL"-LEAVED UMBELLIFERS

ROBERT KRAL

*Herbarium, Box 1705, Sta. B
Vanderbilt University
Nashville, TN 37235*

In doing write-ups of threatened and endangered plant species for the Forest Service during the period 1975–1980, I had difficulty in interpreting those *Oxyopolis* and *Ptilimnium* that develop lineal, cross-septate, terete, quill-like leaves. This confoundment has led me to do some additional field work on such plants and also to consult some loans, for which I am indebted to curators and staffs at GA, UC, US and VSC! In fact, I was even so unenlightened as to refer, in manuscript preparation, to leaves of such plants as "phyllodia", but have been informed by Dr. Lincoln Constance that, according to his colleague Dr. D. R. Kaplan (Bot. Jour. Linn. Soc. V. 63, suppl. 1: 101–125. 1970), linear unifacial leaves in *Oxyopolis* are not phyllodia, which are merely petiole, but actually petiole and rachis with the lateral leaflets suppressed. I have taken the liberty then, in title and text, of applying a shorter, hopefully not controversial term "quill-like", meaning this to apply to a leaf that appears phyllodial but is really both petiole and rachis.

A key to the quill-leaved *Oxyopolis* and *Ptilimnium*, together with some supplemental observations, is presented below in hope that such might prove useful to others who may labor in these genera.

1. Plant perennial, either rhizomatous or stoloniferous, or increasing by crown buds; primary involucral bracts reaching 5–25 mm; petal blade strongly incurved, its apex strap-shaped, bluntish, nearly touching the alate petal midrib, its venation candleabrifform; commissural face of fruit flattened parallel with that of flattened fruit 1. *Oxyopolis* Raf.
2. Plants increasing by rhizomes and stoloniferous rhizomes, these developing from 2 or more of the lower stem nodes; lower internodes strongly suffused with pink or purple, the lower nodes leafless by flowering time; primary rays of umbel usually less than 10 (rarely 11, mostly 5–9); mature fruit peripherally dilated, usually thicker than the central area, the outermost ribs not confined to the seed cavity area *O. canbyi* (C. & R.) Fern.
2. Plants increasing by crown buds, the rootstock a caudex or a stout, short rhizome; lower internodes not pink or purple, the lower nodes generally with at least sheaths persisting, overlapping; primary rays of umbel mostly 10 or more (–20); mature fruit with ribs confined to the seed cavity, the fruit thickest there, progressively thinning to the edge.
3. Petals, sepals, stamens, also often pedicels, dark red or maroon at anthesis; vigorous plants averaging 2 meters tall, with stem bases often 2 cm thick *O. greenmanii* M. & C.

3. Petals white or cream; stamens, sepals and pedicels not reddish at anthesis; plants mostly lower, more slender *O. filiformis* (Walt.) Britt.
1. Plants annual (new rosettes may be produced from nodal buds, but live for but one flowering season!); rhizomes not produced; petal blade spreading at anthesis, only its caudate apex incurved; petal midrib not alate, the venation save for midrib not evident; commissural face of fruit at right angles to plane of mature fruit; primary involucral bracts no longer than 4 mm, or absent; seed in cross section nearly round 2. *Ptilimnium* Raf.

1. OXYPOLIS Rafinesque, Neogen. 2. 1825.

Tiedemannia DC. Coll. Mem. 5:51. 1829.

Archemora DC. Coll. Mem. 5:52. 1829.

This is a small exclusively American genus with five distinct species occurring in the southeastern United States. The genus is distinguished by having five evident calyx teeth, by the dorsiventral flattening of the fruit, the ribbing (except in one species) appearing to be confined to 5 narrow ribs over the seed cavity, by the (in southeastern species) large oil tubes 6, with 4 alternating with the ribs over each seed cavity and 2 on the commissural side, and by the prominent, somewhat buttressed, short-conical stylopodium. The seed are in cross section flattened. All are plants of wetlands.

Of the southeastern species two have compounded leaves, namely *O. ternata* (Nutt.) Heller and *O. rigidior* (L.) Coult. & Rose. The first is a rather rare, slender plant confined to moist pineland savanna from southeastern Virginia south to northern peninsular and northwestern Florida. Its rootstocks produce whorls of short branches which develop fusiform tubers apically; its slender stems below produce a few, long, slender petioles terminating in three (rarely one) elongated-linear or linear-falciform entire leaflets and its few umbels have reduced involucre, capillary primary rays and compact, short-pedicelled clusters of yellowish-green-petalled florets late in the year, with fruit mostly ripening from October into December. Delicate foliage and maroon pigmentation make this a hard plant to spot in the autumnal grass-sedge! *O. rigidior* is fairly common and widespread in all eastern North American physiographic provinces, is normally a stoutish plant distinguished by its coarser leaves which are simply pinnate, the (3-) 5-9 (-13) leaflets usually obovate to oblong or elliptic, very firm, usually toothed, by the large umbels of white petalled flowers in late summer or early fall which later develop a prominently flat and corky-winged fruit typical of the genus. In this species as in all others many of the umbels produce shorter pedicelled male florets toward the center, or in some cases develop accessory compounds that are largely of male florets!

OXYPOLIS FILIFORMIS. Of the three quill-leaved species the most commonly seen is *O. filiformis*, which ranges in wet pinelands, cypress ponds, and broad grass-sedge marsh from eastern North Carolina south to southern Florida, the Bahamas and Cuba, west in the Gulf Coastal Plain into eastern

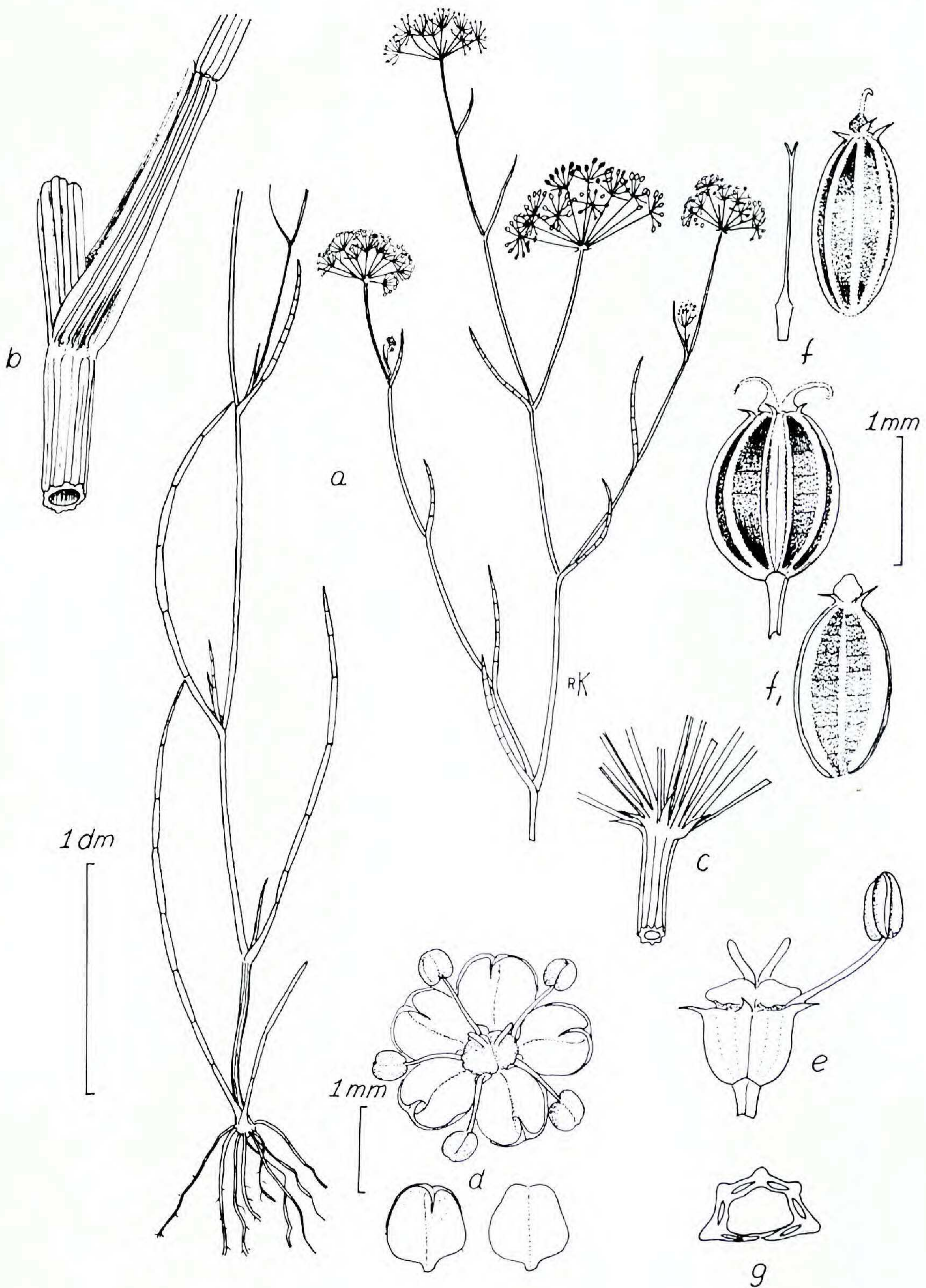
Texas. Its rootstock is caudiciform, less often a stout, ascending rhizome which develops as a lateral offshoot bud, its lower leaves are usually strongly overlapping at the level of the stoutish, fleshy, sheathing petiole, the terete, fistulose, septate blades erect or excurvate, stiffish and usually very brittle. In a normal season the stems are stoutish, sometimes fully a centimeter or more thick at base, and mostly range from one to two meters tall, the upper internodes rather distant, the upper leaves short-sheathed, rigid and linear-conical. The erect-peduncled umbels normally have involucre bracts at least 5 mm long (mostly 1.0–1.5 cm), the primary rays are stiffish, from 10–20, 2 cm or more long, terminate in shorter secondary involucre with mostly 10–20 pedicels, these developing white-petalled florets. The mature fruit is in character and overall dimension similar to that of the next species, namely:

OXOPOLIS GREENMANII is the largest species in the genus, with healthy plants often reaching 2.5 meters in height. Vegetatively this is similar to the preceding but quantitatively bigger in all respects save flower and fruit. It is the most narrowly endemic species, being found only in Franklin, Bay, Gulf and Calhoun counties in the Florida panhandle (lower Apalachicola-Chipola River drainage!) It differs strikingly from all other southeastern *Oxypolis* in the deep maroon pigmentation of its flowers and pedicels and is in the field so distinctive as to make one wonder how it could have escaped the written notice of taxonomists until 1942. The best habitat for it is found in the shallow, shrub-*Hypericum* bordered ponds that dot the Slash-pine-Saw palmetto-cypress-titi flats between Port St. Joe and Wewahitchka in Gulf County. Much of this original habitat is now endangered in that it is being ditch-drained, cleared mechanically and converted either to the monotony of pine plantations, large "improved" pastures or row crops. Thus *O. greenmanii* is a likely candidate for protection as an endangered species.

OXYPOLIS CANBYI (Coulter & Rose) Fern., *Rhodora* 41(484): 139. 1939.

Oxypolis filiformis (Walt.) Britt. var. *canbyi* Coulter & Rose, *Contr. U.S. Nat. Herb.* 7(1): 193–194. TYPE: U.S.A. DELAWARE. Sussex Co.: moist upland meadows. Ellendale, Aug 1867, *W. M. Canby* (HOLOTYPE: US!).

O. canbyi has an unusual geographic range. The wet meadows in Coastal Plain Delaware where it was first found by Canby no longer harbor it. Now it can be found only in South Carolina and Georgia where it is local in shallow cypress-pine sloughs or in wet grass-sedge savanna. Some localities for it have passed unnoticed in that flowering specimens collected without the distinctive rhizome bear a strong resemblance either to *Oxypolis filiformis* or to specimens of quill-leaved *Ptilimnium*, and have been so identified. M. L. Fernald, taking note of the different leaf and very different fruit elevated its rank to that of species, but for some reason did not observe the rhizomal character (nor for that matter did Coulter and Rose!)



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Fig. 1. *Oxypolis canbyi*. a. habit sketch (Kral 56164); b. enlarged view of node and leaf base (Kral 60814); c. flower viewed from below (upper left), from top with stamens removed (lower left), from side; d. various views of petal, including cross-section (Kral 62314); e. anthers; f. mature fruit of *O. filiformis* (Kral 32625); g. mature fruit of *O. canbyi* (Kral 60814).

which is so unlike that of any other *Oxypolis*. The good stands of it yet to be seen in the flatlands between Albany and Leesburg and between Leesburg and Leslie in southwestern Georgia have provided me the basis for the following remarks.

The rootstock of *O. canbyi* is a fairly slender, ascending rhizome that develops as a branch bud from rather deep-set, slender, forking horizontal rhizome. This ascending rhizome expands distally into an erect, purplish or pinkish, short-internoded, fistulose stem base which is usually submersed or embedded in peat-muck and which produces from its close-set nodes whorls both of roots and lax, elongate, pale, stoloniferous rhizomes, some several decimeters in length and which root at their distant nodes to produce new plants. In short, this is a strongly cloning species which can in some cases become an aspect dominant.

Secondly, *O. canbyi* has slender, whip-like, elongate, gradually tapering cauline leaves, the bases of which are abruptly dilated and clasping but definitely are not as stout as in the preceding species. Neither are the plants averaging as tall.

The umbels produced per normal plant are fewer, usually three, with less primary rays, usually 10 or less, ranging down to six, and the whole umbel ranges narrower. The flowering season is earlier than it is for contiguous populations of *O. filiformis*; *O. canbyi* begins to flower in May, continues into early August. Neighboring populations of *O. filiformis* are usually budding and flowering at a time when mature fruit is forming in *O. canbyi*. However, it should be noted that flowering times in this genus appear to be latitudinally related, that the now extinct population of *O. canbyi* from Delaware flowered in August, and that *O. filiformis* has over its total range a flowering time that covers most of the year!

It is in the fruit that *O. canbyi* is most different. While in the other species the ribs of the fruit overlie the seed or directly border it, the two peripheral ribs of an *O. canbyi* mericarp overlie a dilated corky tissue well toward the fruit edge. (See plate comparing fruit of the two types!).

This plant is seriously endangered in that much of its original habitat has been, or is being, destroyed. The shallow flatwoods ponds and low pine-land savanna which are its best habitat are being ditch-drained, then bulldozed and converted to lowland pasture, to row crops (usually soy beans) or to pine plantations so that some areas known to me now have *Oxypolis* persisting only in ditches at edges of fields or plantations. I have yet to learn of any locations that are presently protected! Thus it is to be hoped that those botanists in the southeast who read this are alerted to looking for new localities for *O. canbyi* and will move to protect the plant.

Specimens examined: DELAWARE. Sussex Co.: moist upland meadow land near Ellendale, Aug 1867, *W.M. Canby* (Type!); Aug, 1874, *Canby* (US); swamps, *A. Commons*, 16 Aug 1877; Sep 1891, *Canby* (US). (All of these are presumably from the same station, which has been for many years destroyed!) GEORGIA. Burke Co.:

sandy peat of cypress-bottom by Ga. 24, ca 7 mi W Waynesboro, 31 Jul 1980, *Kral* 66049; pond pine-pond cypress swamp by Ga. 24, 8.2 mi W Waynesboro, 7 Aug 1975, *Kral* 56164. Dooly Co.: open partially drained cypress pond of W side of railroad, 2.7 mi SSE Unadilla, 31 Jul 1953, *Duncan, Harper, et al* 16814 (GA); cypress pond about half way between Unadilla and Pinehurst, 31 July 1953, *Harper* 4255 (ALU, GA, VDB). Lee Co.: moist pine barrens near Adams, 1 Aug 1901, *Harper* 1147 (US); grassy area in cypress swamp in standing water with *Lobelia boykinii*, 10 mi N Leesburg, 22 Aug 1940, *McVaugh* 5235 (UC); moist pineland-cypress swamp area 6 mi NE of Leesburg, 22 Aug 1948, *Thorne & Muenscher* 8352 (UC); flatwoods pond edge by US 19, ca 5 mi N Leesburg, 28 Jun 1977, *Kral* 60502; same locality, 20 Jul 1978, *Kral* 62314; drying bottom of shallow flatwoods pond by US 19, ca 5 mi S Leesburg, 19 Aug 1977, *Kral* 60814. Sumter Co.: disturbed pineland pond by US 280, ca 5 mi NW Leslie, 2 Aug 1980, *Kral* 66083. SOUTH CAROLINA. Colleton Co.: cypress-*Ilex* pond on S.C. 63, 2.8 mi SE Snider's Crossroads, jct. S.C. 21 and 63, *Radford & Bozeman* 11439 (GA, NCU, VSC, VDB). Hampton Co.: savanna along railroad, 0.2 mi N of Luray on US 321, 29 Jun 1956, *Bell* 3949 (NCU, VDB).

2. *PTILIMNIUM* Rafinesque, *Am. Mo. Mag.* 4: 192. 1819; Neog. I: 2. 1825.

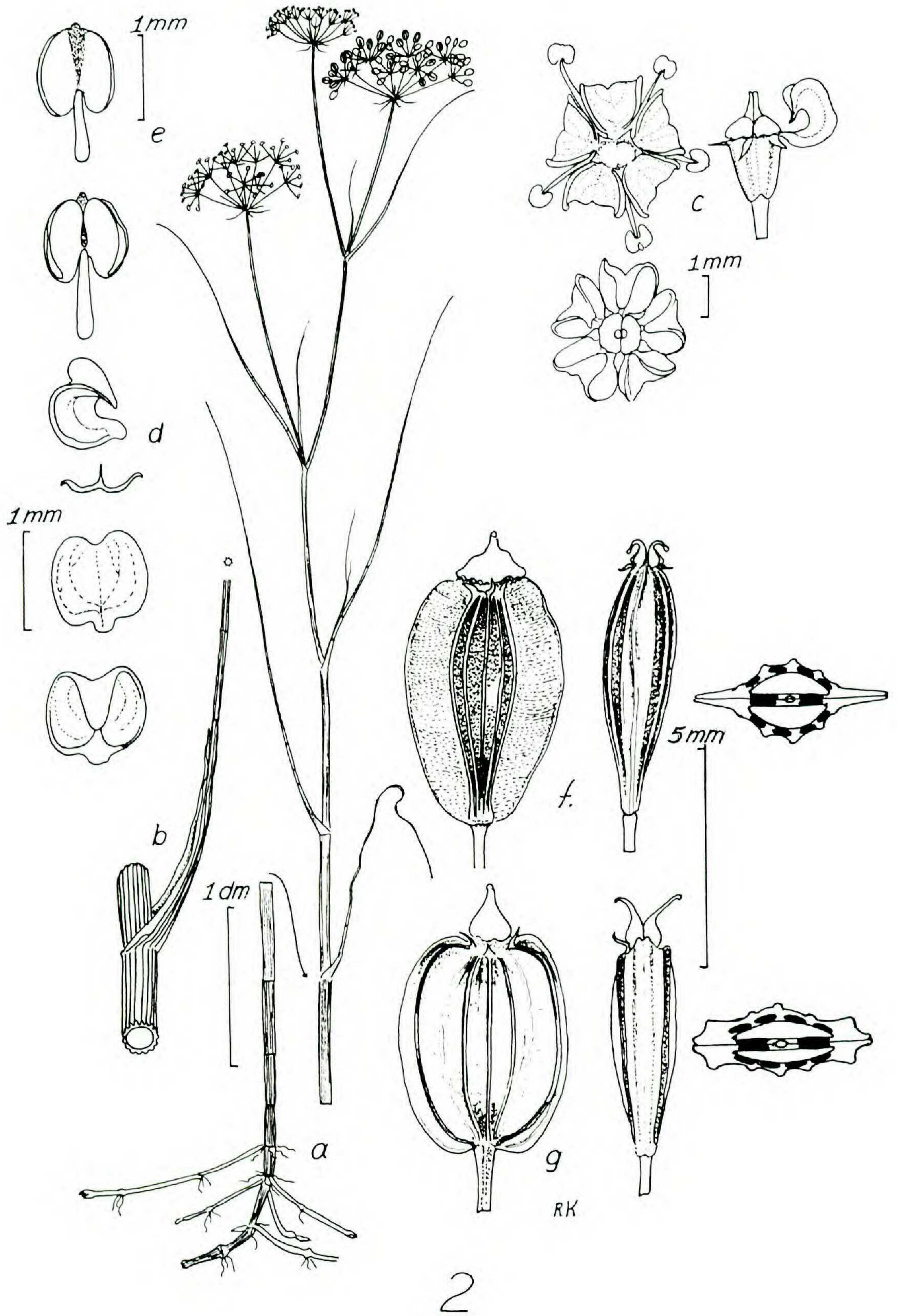
Discopleura DC. *Coll. Mem.* 5: 38. 1829.

Harperia Rose, *Proc. U.S. Nat. Mus.* 20: 441. 1905 (non *Harperia* Fitzgerald, 1904).

Harperella Rose, *Proc. Biol. Soc. Wash.* 19: 96. 1906.

This genus was carefully studied by Dr. N. W. Easterly (1957) and needs no further nomenclatural qualification. The only species described as *Ptilimnium* until the quill-leaved ones were discovered were the commoner, more widespread, pinnately-decompound-leaved ones, namely *P. capillaceum* Raf. (type for the genus!), *P. costatum* (Ell.) Raf., and *P. nuttallii* (DC) Britton, all of which have an involucre of conspicuous bracts at least 5 mm long. The quill-leaved plants now referable to *Ptilimnium* and which have involucres small or totally absent were all described by Rose (1906) as three *Harperella*. These, after transferal to *Ptilimnium* by Dr. Mathias (1936) were reduced to but two species in Easterly's (l.c.) treatment, namely *P. nodosum* (Rose) Mathias, a tallish, more profusely floriferous, non-proliferous annual from the Coastal Plain of Georgia and *P. fluviatile* (Rose) Mathias (including *P. viviparum* (Rose) Mathias), a lower and riverine plant tending to be fewer-flowered and proliferous.

These plants, whatever their true taxonomic status, are rare, though they may be extremely abundant in a few of their known localities. For years plants referable to *P. nodosum* were known only from two places in the Coastal Plain of southwestern Georgia, but additional localities in Aiken County, South Carolina were later found. On the other hand Easterly cited more localities for *P. fluviatile*, reporting it from scattered localities along the Potomac and tributaries in West Virginia and Maryland, southward to the Deep and Tar Rivers in Chatham and Granville counties respectively in North Carolina, and inland into the Cumberland Plateau of Alabama (Cullman, DeKalb counties). For some reason he did not cite collections made from Cherokee County Alabama made by Harper as well as some also made by Harper (and in fact also by Easterly) from the North River



in Tuscaloosa County Alabama.

In order to get some decent concepts of the two plants I have made some attempts to locate good populations of both. In the case of *P. fluviatile* this was not difficult in that it is still locally abundant along the Little River in northeastern Alabama, thus it was possible to get a good idea of the variation within these populations.

Finding *P. nodosum* localities provided more of a problem in that even at the time Easterly did his fieldwork he was able to find but one surviving population of the two then known, namely the one south of Unadilla, Dooly County, Georgia, originally discovered by Dr. Harper; the type locality in Schley County appeared to have been lost. However, there were reports of the plant still existing in Aiken County, South Carolina and I was able, thanks to directions given by Dr. D. Rayner of the South Carolina Heritage Program, to locate a good population there. This consisted in 1980 of many hundreds of plants growing in a wet peaty fringe around a shallow upland pond, a habitat similar to that described for the type from Georgia. A study of this population plus the *P. fluviatile* from along the Little River in Alabama, has allowed me to make more sense of specimens of such plants collected over their entire range, as well as to suggest a more conservative taxonomy.

The differences between *P. nodosum* and *P. fluviatile* as given by Rose (l.c.), Small (1933), Easterly (l.c.) and later by Radford et al. (1968) in composite have to do with the former being taller (3.5–10.0 dm versus 2–5 dm) with rays more numerous (6–15 versus 5–7) and longer, with pedicels 3–6 mm long (versus 3 mm or less) and flowers 3.0–3.5 mm wide (versus 1.0–1.5 mm). The former is supposed to bloom earlier (May and June) than the latter (July to October). The former is non-proliferous while the latter develops proliferous nodes which root when the main stem topples to produce tufts of overwintering phyllodes.

Unfortunately, none of the character differences given above hold up with sufficient consistency. Fruit characters employed by Small (l.c.) do not hold.

Large samples of *P. fluviatile* from along the Little River show a complete range from low, much-branched, delicate, proliferous plants with rosettes of leaves and few-rayed, smaller-flowered umbels similar to the type of *P. fluviatile* all the way over to tall, more robust, non-proliferous individuals with larger and more florets on longer rays that could well be fitted into the type material of *P. nodosum*! The few specimens collected

Fig. 2. *Ptilimnium nodosum*. a. habit sketch (Easterly 17); b. enlarged view of node and leaf base; c. enlarged view of base of primary rays and involucre; d. top view of floret (above), upper view of petal (lower left), lower side of petal (lower right); e. side view of gynoeceium at anthesis; f. carpophore and anterior view of mericarp (top), side view of fruit (below); f-1. commissural face of mericarp; g. median-cross-section of mericarp. (f-g from Kral 66052).

from along the North River in Tuscaloosa county Alabama, and those from the Eastern seaboard rivers also vary widely.

Inspection of the total habitat occupied by these plants in the Little River system provides a possible answer, in that the larger plants are usually from well-spaced individuals from the higher seep areas which are rarely inundated, while the lower, smaller-rayed and flowered individuals are rather consistently from places that are flooded frequently. Thus the latter tend more to be toppled by flood water, would therefore tend to root along the nodes, while the former, not so subject to frequent flooding, would tend to keep an erect and non-proliferous habit. The taller plants are also more likely to be "trained" erect by the greater abundance and size of other herbs more suited to higher seep areas. The *P. nodosum* from the Coastal Plain of South Carolina again shows a wide range in regard to all critical characters save that the plants do not develop from leafy tufts. This is probably explained in terms of the different sort of habitat afforded, in that the plants, being part of a strong fringe of grass-sedge around ponds, are less likely toppled, thus would tend less to formation of proliferous and overwintering nodes. Whatever the case, taller plants from Little River fit as well within the range of the South Carolina material as they do within the type material from Georgia. Only the very large extremes of *P. nodosum*, the Harper collections from Dooly County, Georgia, show a break, with by far the largest umbels, the stoutest stems.

The upshot of this is that there appears to be no way to draw descriptions and keys that take the common variation into account and yet distinguish two species or even two varieties. Two other facts also shed light. First, the haploid chromosome complement for both of the quill-leaved *Ptilimnium* is six, an indication of a similar genetic system. (*P. capillaceum*, *P. costatum* and *P. nuttallii* are according to Easterly 14, 16 and 7 respectively!) Secondly, a homologous variation as to size of plant, number of primary umbel rays, size of and number of florets and fruit may be found in the compound-leaved species of *Ptilimnium*. This range too may be explained perhaps in terms of habitat differences or even in simple spacing of individuals within a population. Any large collection of *Ptilimnium* shows this, with larger plants wide-spaced.

Therefore it seems appropriate to treat *P. nodosum* and *P. fluviatile* as instances of extreme variation brought about by ecological extremes in that too many instances of intermediacy in key characters exist for one to do other than treat the two taxa as one. The earliest name is *P. nodosum* (Rose) Mathias.

Specimens examined: ALABAMA. Cherokee Co.: among rocks below high water along Little River in May's Gulf on Lookout Mt., 15 Aug 1945, *Harper* 3393 (NY, US); siliceous rocky banks of Little River just S of Canyon Mouth Park branch of DeSoto State Park, 30 Aug 1969, *Kral* 36582 (VDB). Cullman Co.: Cullman, swamps, 1887, *Mary Mohr* (US). DeKalb Co.: rocky bed of Town Creek on Sand

Mountain near Chavies, 24 Nov 1905, *Harper 8* (HOLOTYPE: US; ISOTYPE: NY of *P. fluviatile!*); rocky bed of Little River on Lookout Mt., 25 Nov 1905, *Harper 14* (NY, US); miry shallows of Town Creek below the falls, N of Geraldine, 28 Aug 1933, *Harper 3100* (US); miry shallows of Town Creek above the falls, N of Geraldine, 28 Aug 1933, *Harper 3097* (NY, US—tall material much like Potomac River specimens of *P. viviparum*, evidently silt-coated and bent so as to root and bud); along Town Creek above the falls at Elrod's Bridge on Sand Mountain, 28 Aug 1933, *Harper 3097* (NY); abundant in Little River at State Rt. 35, ca 14 mi NW of Gaylesville, 7 Jul 1978, *R.R. Haynes 6589* (VDB); along cracks in sandy flatrock shallows, also sunny seeps, Little River above Ala. 35 bridge, 27 Jul 1977, *Kral 60635* (VDB, a large population sample showing wide and overlapping morphological range!); rocky shoals of Town Creek near Chavies, rte 110, 15 Aug 1956, *W. Easterly 151* (US). Tuscaloosa Co.: rocky shoals in North River, ca 14 mi N of Tuscaloosa, 30 Jun 1936, *Harper 3530* (NY, US—tall and non-viviparous as in *P. nodosum* proper but few primary rays, as in *P. fluviatile*); rocky shoals of North River 15 mi N of Tuscaloosa, Rte 43, 14 Aug 1956, *W. Easterly 141* (US & NY respectively—tall plants similar to the type in regard to length of rays and size of florets; this locality has since been destroyed, is now Lake Tuscaloosa!). Walker Co.: Fowl Shoals, very scarce, *E. A. Smith*, Aug 1877 (US). GEORGIA. Dooly Co.: in large shallow pine barren between Pinehurst and Unadilla, 21 May 1904, *Harper 2220* (NY, US—paratype—by far the largest material ever collected of the species with stem bases to 1 cm thick, inflorescence rays up to 16, flowers fully 3.5 mm across!); 2 mi S of Unadilla along railroad, dried out ditch, 17 May 1955, *F. H. Sargent 7210* (GA—this material quite comparable to the Schley Co. holotype!) drainage ditch along Southern railroad, 2 mi S of Unadilla, Rte. 41, 30 May 1956, *Easterly 16* (NY), *Easterly 17* (US). Schley Co.: shallow (now dry) pond near Ellaville, 10 Jul 1902, *Harper 1411* (HOLOTYPE: US, ISOTYPES: NY!—material comparable to this may be found in DeKalb Co. Alabama and Aiken Co., South Carolina!). MARYLAND. Washington Co.: near Hancock, 5 Oct 1910, *J. N. Rose* (UC, US—type material showing a low stature, few primary rays, vivipary—this is the original material of *P. viviparum* (Rose) Mathias!); gravel beaches, Potomac River, 1.5 mi W of Hancock, 13 Jul 1906, *Shreve & Jones 746* (NY, US—this shows a tallish habit, is a flood reaction with viviparous habit!). NORTH CAROLINA. Chatham Co.: Moncure, 7 Aug 1956, *Bell 4410* (NY, UC); in gravelly seeping soil, rocky bed of Deep River behind Lockville Dam, 2 Aug 1955, *Beard 1244* (NY); 150 yds. below Lockville Dam, 7 Aug 1956, *Beard 1286* (UC). Granville Co.: in sand bar in middle of Tar River, 10 mi S of Oxford on hwy 96, 4 Jul 1956, *J. P. Gillespie 397* (UC—this shows a tallish habit, leaves thick as in extremes of the Georgia material, primary rays no more than 6!). The North Carolina specimens show a range from small extremes of *P. fluviatile* well into type material of *P. nodosum* as to height and leaf character! SOUTH CAROLINA. Aiken Co.: ca 1 mi S Monetta just NE of Rte. S.C. 29, pond bank, 31 Jul 1980, *Kral 66052* (VDB—population sample showing a good range between *P. nodosum* and *P. fluviatile!*); distributed savannah-like area, Montmorenci, 10 Jun 1962, *Ables & Baird 56922* (NCU, UC, VSC—the same as the Monetta material!). WEST VIRGINIA. Jefferson Co.: near Harper's Ferry, *Dr. Aiken*, no date or collection number (NY). Morgan Co.: wet bank of Sleepy Creek at jct. with Rte. 9, 21 Jul 1956, *Easterly 121* (US—a fairly tall, erect specimen but with short, few primary rays!)

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